

U. S. DEPARTMENT OF COMMERCE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
NATIONAL WEATHER SERVICE
NATIONAL METEOROLOGICAL CENTER

OFFICE NOTE 290

REAL-TIME BATHY THERMOGRAPH ANALYSES

VERA M. GERALD
MARINE PRODUCTS BRANCH

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THIS IS AN UNREVIEWED MANUSCRIPT, PRIMARILY INTENDED FOR
INFORMAL EXCHANGE OF INFORMATION AMONG NMC STAFF MEMBERS.

INTRODUCTION

This report gives a synopsis of the weekly real-time experimental bathythermograph (BATHY) sea surface and 100 meter subsurface temperature analyses produced during the past two years by the Marine Products Branch. The charts are drawn subjectively using a two week composite of BATHY data in the area of the NE Pacific from 20-60 degrees north latitude and 108-155 degrees west longitude. This region was chosen because of its' relatively high BATHY concentration.

USEFULNESS OF BATHY DATA

A BATHY probe gives a vertical profile of the ocean's temperature with depth. BATHYS can be launched by aircraft (AXBT) or ship (XBT). BATHY data are utilized to produce subsurface analyses, such as:

1. Subsurface temperature analyses at several depths (100, 200, 300, or 400 meters).
2. Specific isotherm topography analyses, that is, the depth of the 5, 8, 10, or 15 degree isotherms.
3. Mixed layer depth analyses.
4. Heat content analyses.

Analyses of these type are very important factors in monitoring:

1. Air-sea interaction processes (heat fluxes) affecting climatic changes.
2. Prediction of frontal locations and major currents.
3. Fish migration and location of feeding grounds.

DATA SET

The BATHY data come from the NWS.NMC.PROD.RAWDTA.MISCO2 rotating file.

This data set consists of daily reports collected from U. S. Coast Guard and Navy ships, aircraft, research vessels, and ships of opportunity. This is a very small data set. Globally the National Meteorological Center receives approximately one-hundred BATHY reports daily from the Global Telecommunications System (GTS). Thirty to forty percent of the incoming data contain errors. Figures 1 and 2, respectively, show bi-weekly and monthly BATHY data distributions for the NE Pacific area.

DATA PREPARATION

A set of quality control computer programs were installed on the 360/195 to develop subsurface temperature analyses and detect, flag, and correct data errors within the BATHY reports used in these analyses. The graphic plots show a one week sample of aircraft and ships:

1. Tracks at the surface (Figure 3).
2. Distribution of the temperature profiles (Figure 4).
3. Temperature at the surface (Figure 5).
4. Temperatures at 100 meter depth (Figure 6).
5. Depth of a specific isotherm (Figure 7).
6. Mixed layer depth (Figure 8).
7. Spike/Gradient check (Figure 9).

Flagged BATHY reports that are not corrected automatically are corrected manually. Common correctable errors found within BATHY messages include:

1. Date and Time

- Year and/or month indication is wrong.

2. Position

- Quadrant value is illegal; latitude and/or longitude is interchanged and/or minute value exceeds 59.

3. Depths

- Duplicate depths reported; depths do not increase; depths reported in feet.

4. Temperatures

- Reported in degrees fahrenheit; outside range -2 to 35 degrees centigrade; duplicate surface temperature reported.

Errors caused by poor choice of inflection points, faulty instruments, or inaccurate temperature readings are difficult to correct automatically and are left up to the analyst whether the BATHY report is to be accepted or rejected.

ANALYSIS METHOD

Once the data are corrected they are transferred to a mercator base chart. The BATHY sea surface temperature (SST) data are subjectively contoured by comparing them to the National Weather Service (NWS) five day composite objective SST analysis, the previous week BATHY SST analysis, and the Robinson's Climatological Atlas (M. K. Robinson, 1976). The BATHY SST analysis (Figure 10), is produced to preserve vertical consistency between the surface and subsurface temperature analyses.

The BATHY 100 meter subsurface temperature data are subjectively contoured by comparing them to the BATHY SST analysis, the previous week 100 meter subsurface temperature analysis, and the Robinson's Climatological Atlas (M. K. Robinson, 1976).

The BATHY 100 meter subsurface temperature analysis (Figure 11) is distributed weekly by mail and fax to users.

REFERENCES

Robinson, Margaret K., *Atlas of North Pacific Ocean Monthly Mean Temperatures and Salinities of the Surface Layers*, Scripps Institution of Oceanography, University of California, Naval Oceanographic Office Reference Publication 2, 1976.

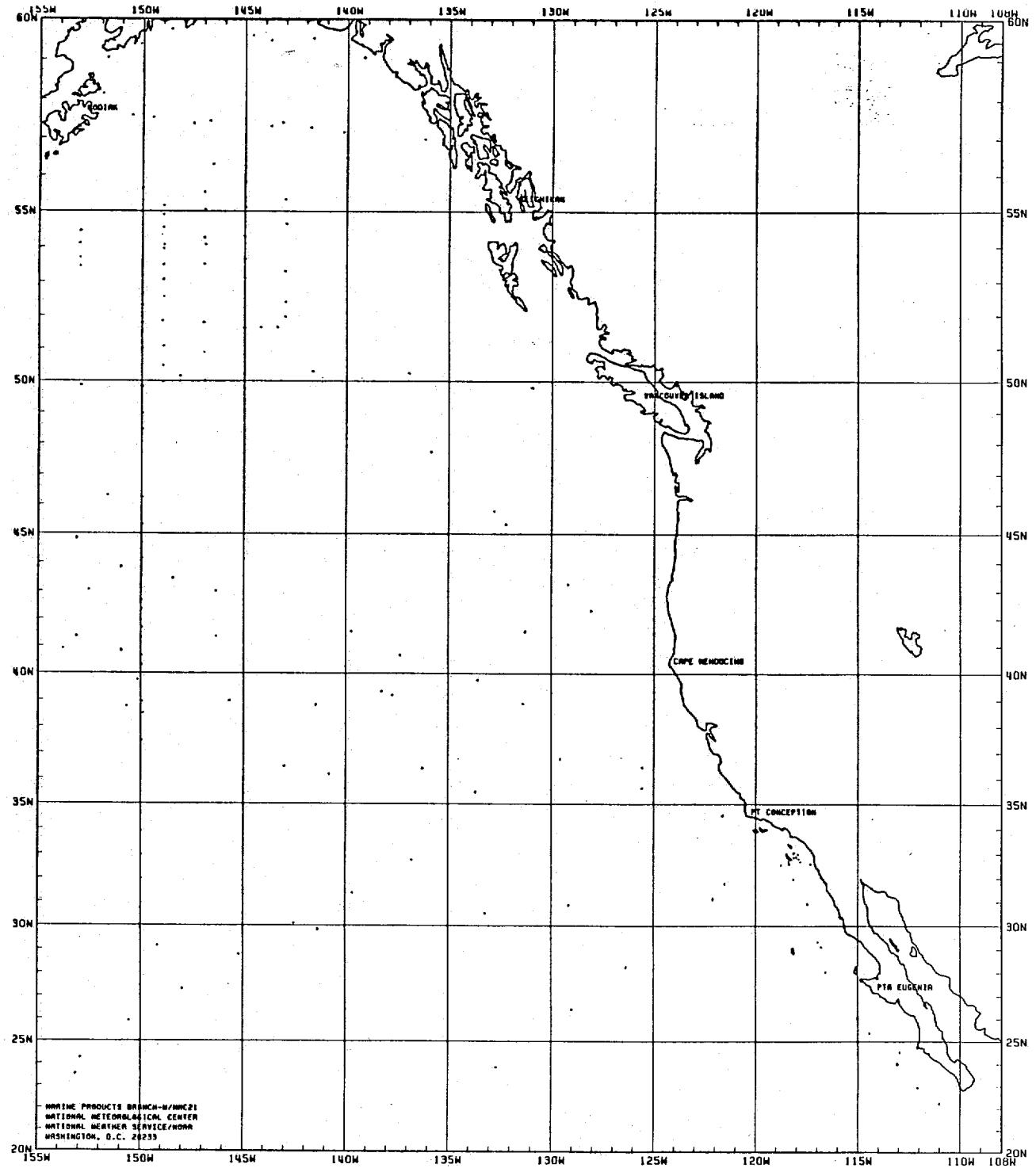


Figure 1
BATHY Bi-weekly Data Distribution
Feb. 18 - Mar. 3, 1984
178 Reports

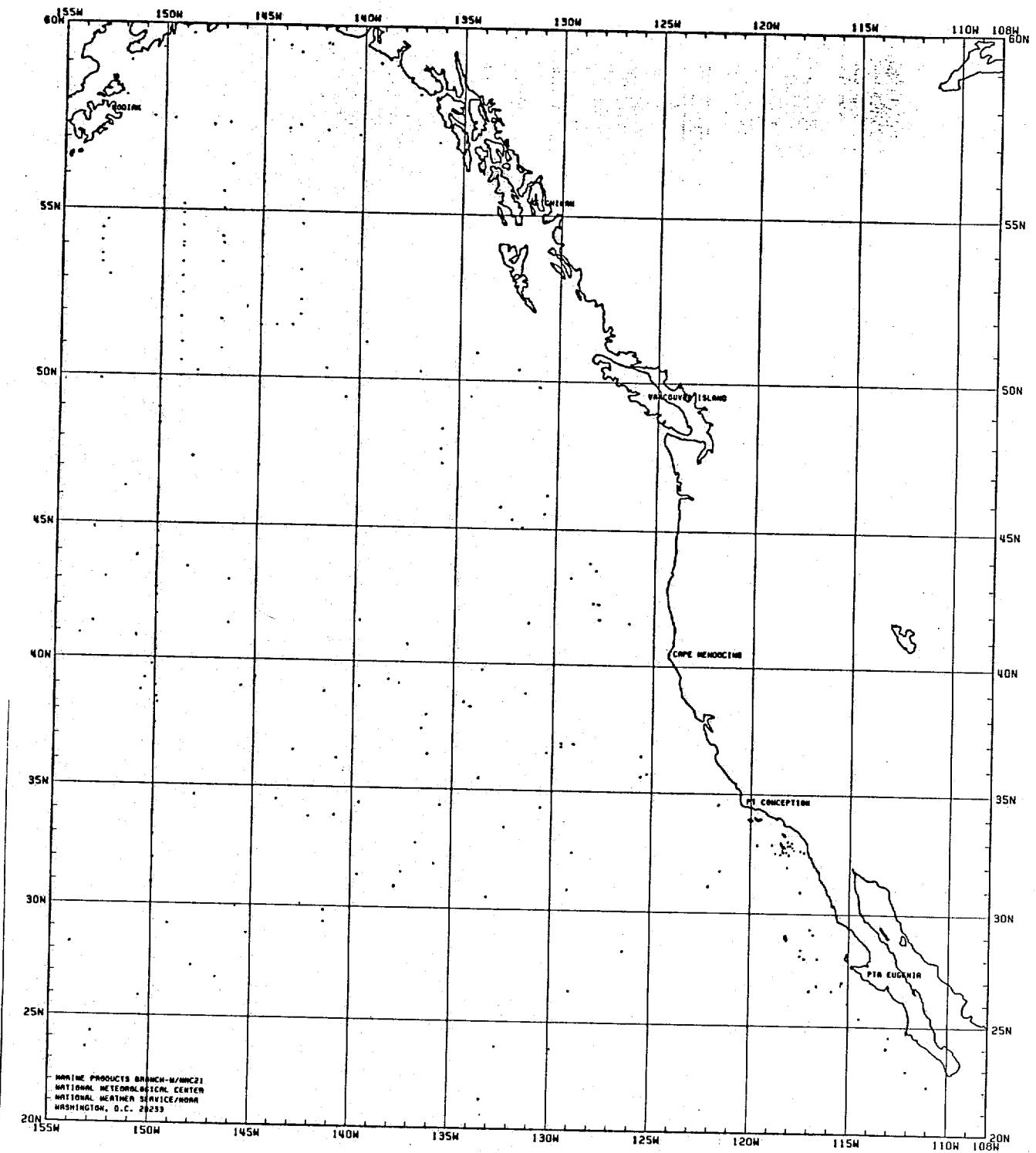


Figure 2
BATHY Monthly Data Distribution
Feb. 18 - Mar. 18, 1984
245 Reports

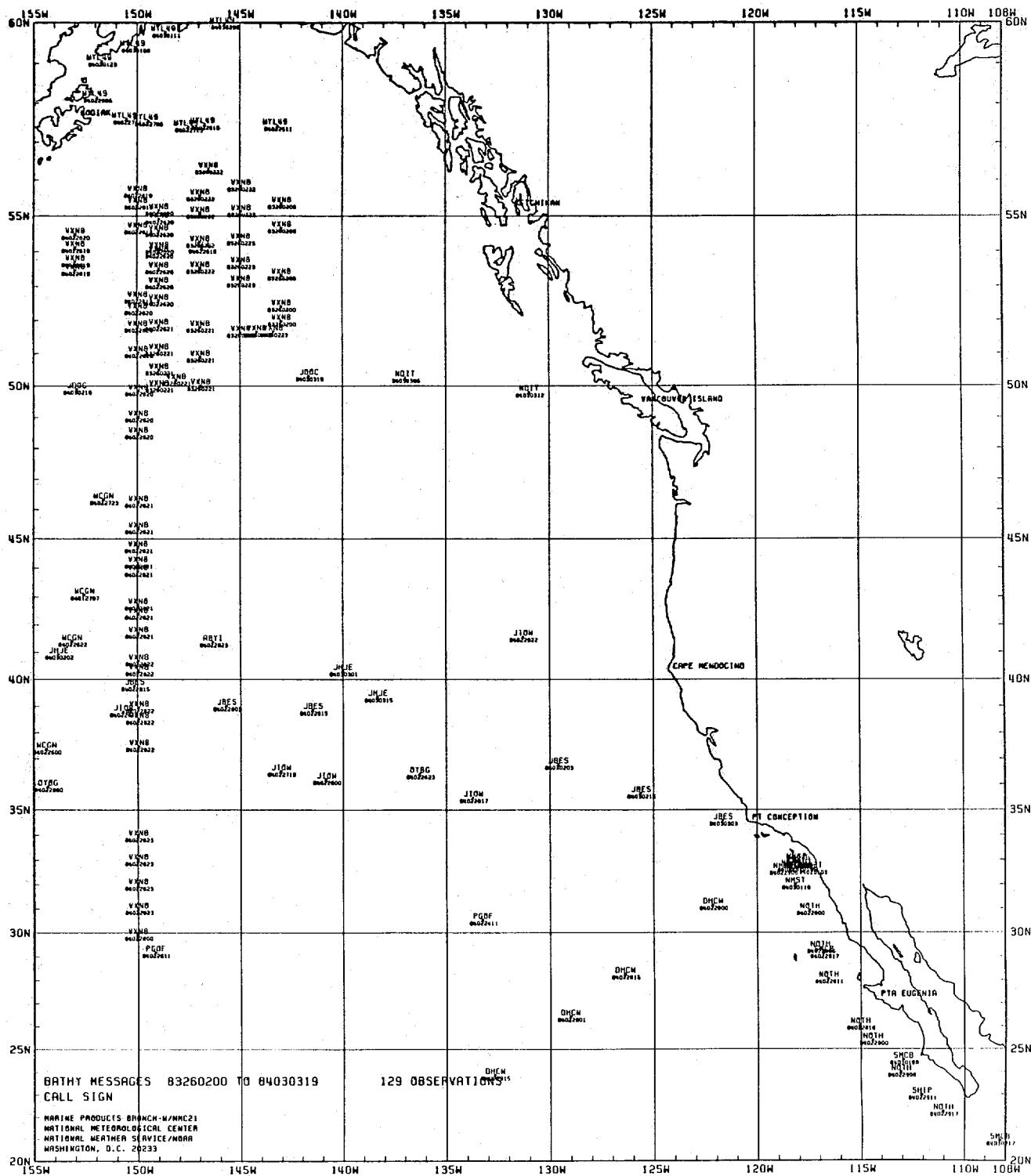


Figure 3

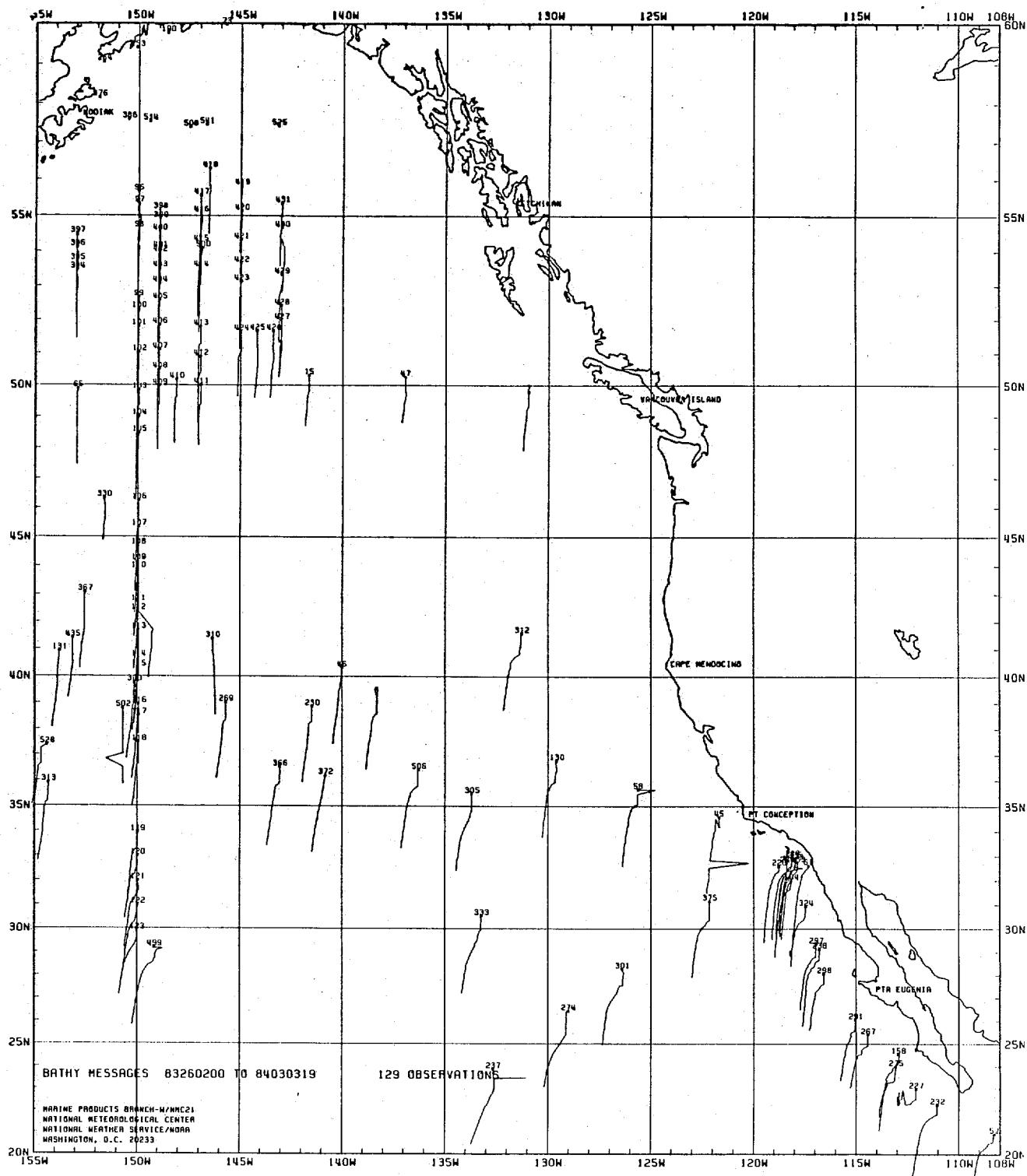


Figure 4
Distribution of BATHY Profiles
Feb. 26 - Mar. 3, 1984

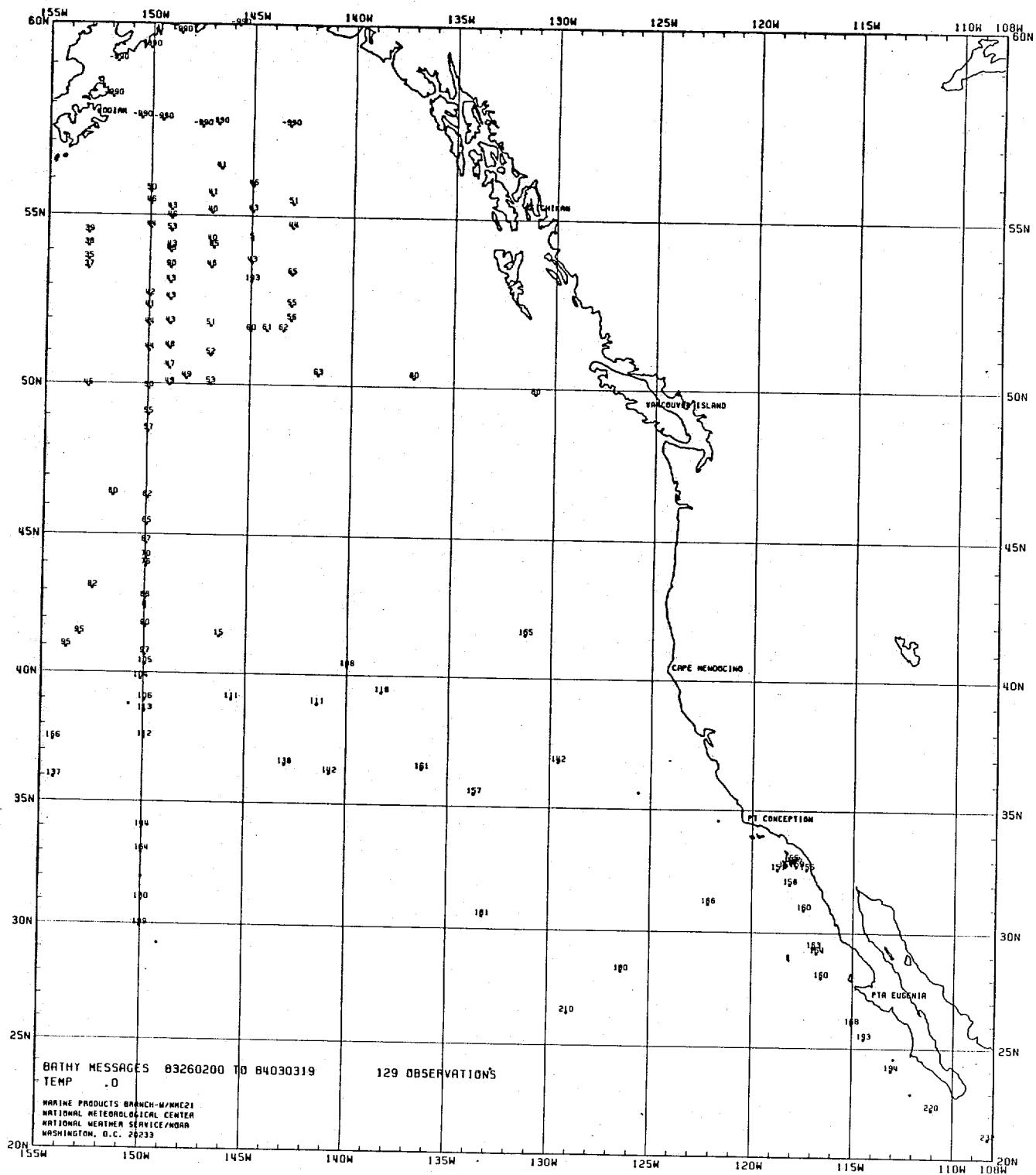


Figure 5
BATHY SST Data Distribution
Feb. 26 - Mar. 3, 1984

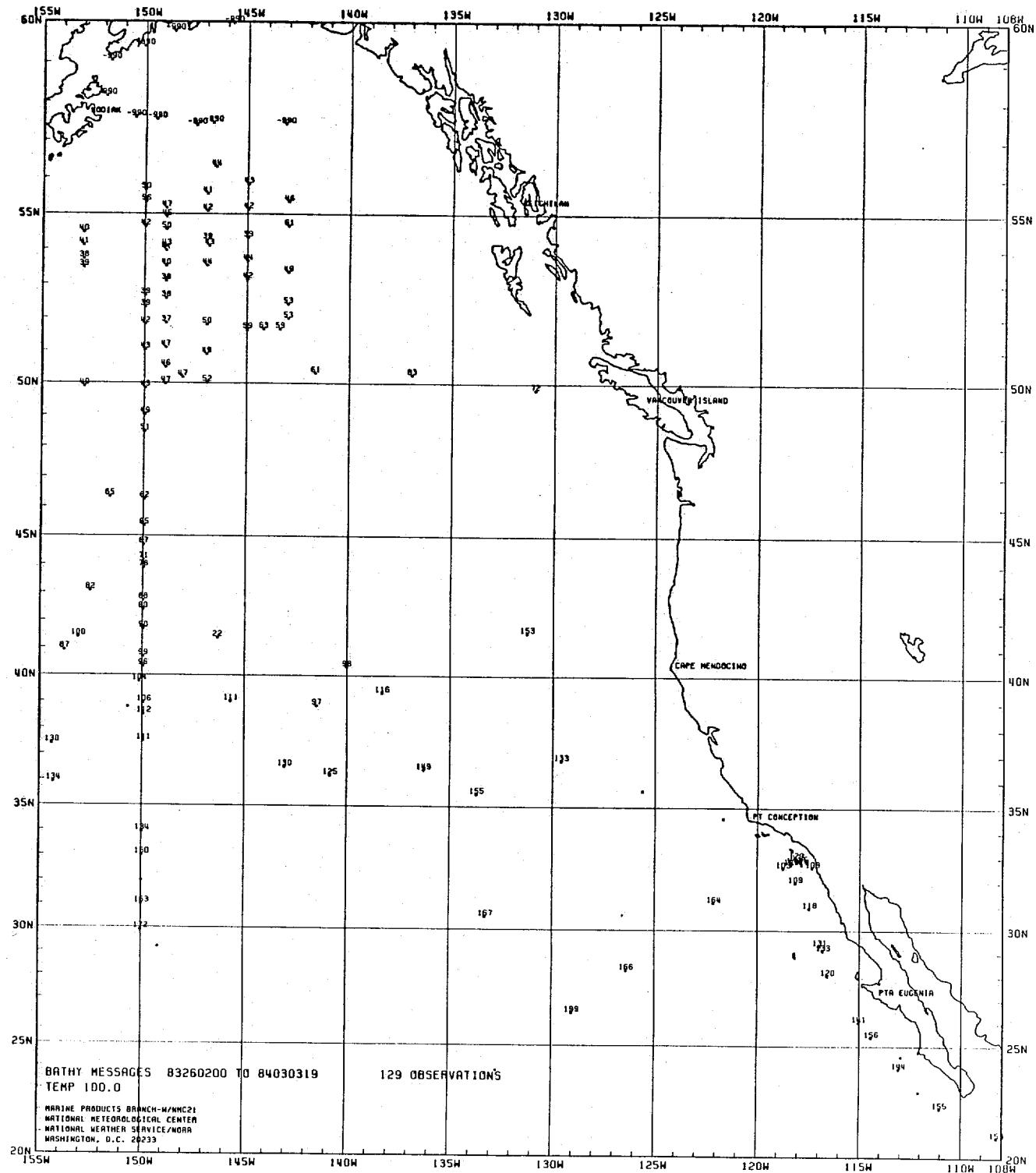


Figure 6
BATHY 100m Temperature Data Distribution
Feb. 26 - Mar. 3, 1984

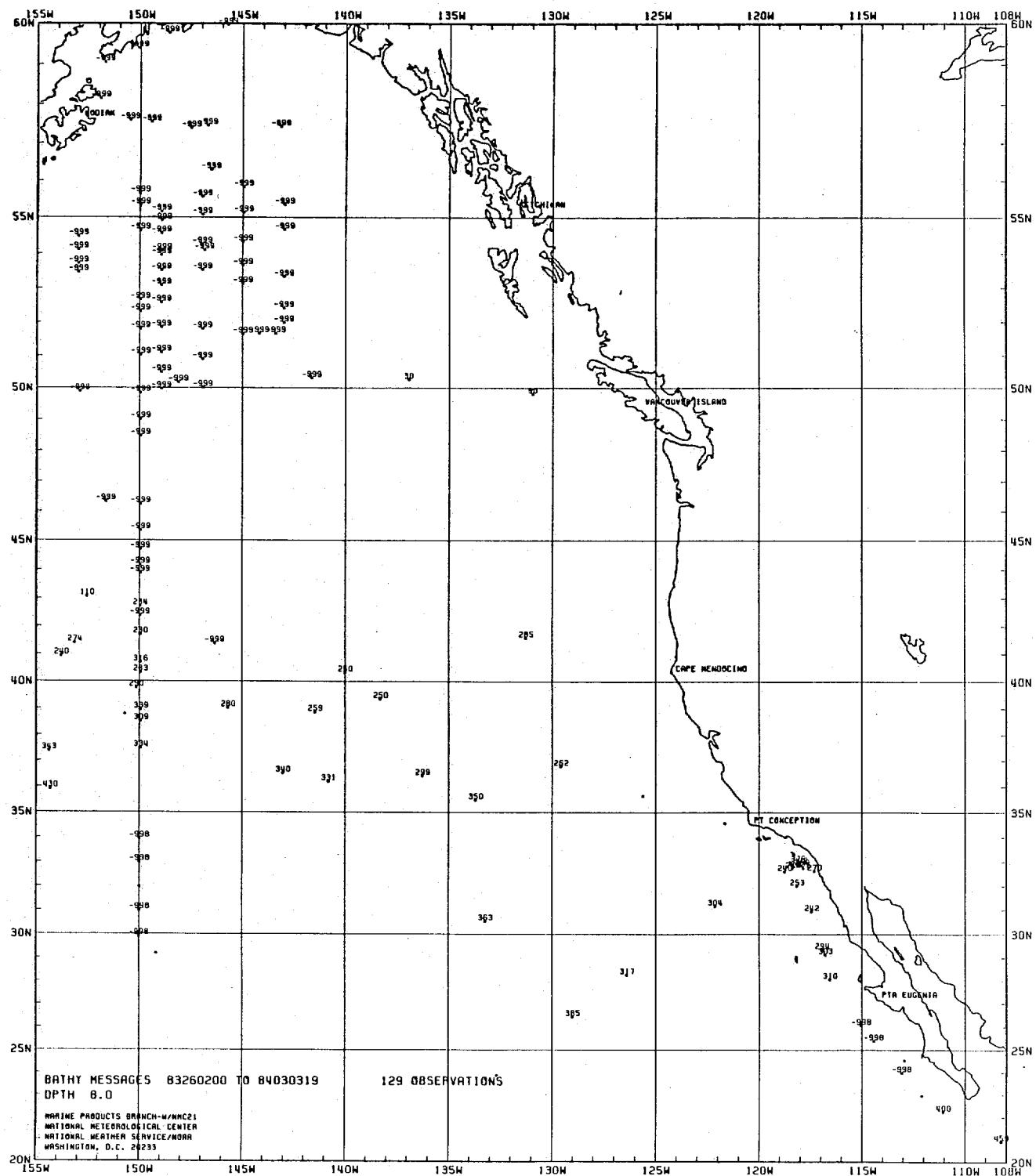


Figure 7
 Depths of the 8°C Isotherm
 Feb. 26 - Mar. 3, 1984

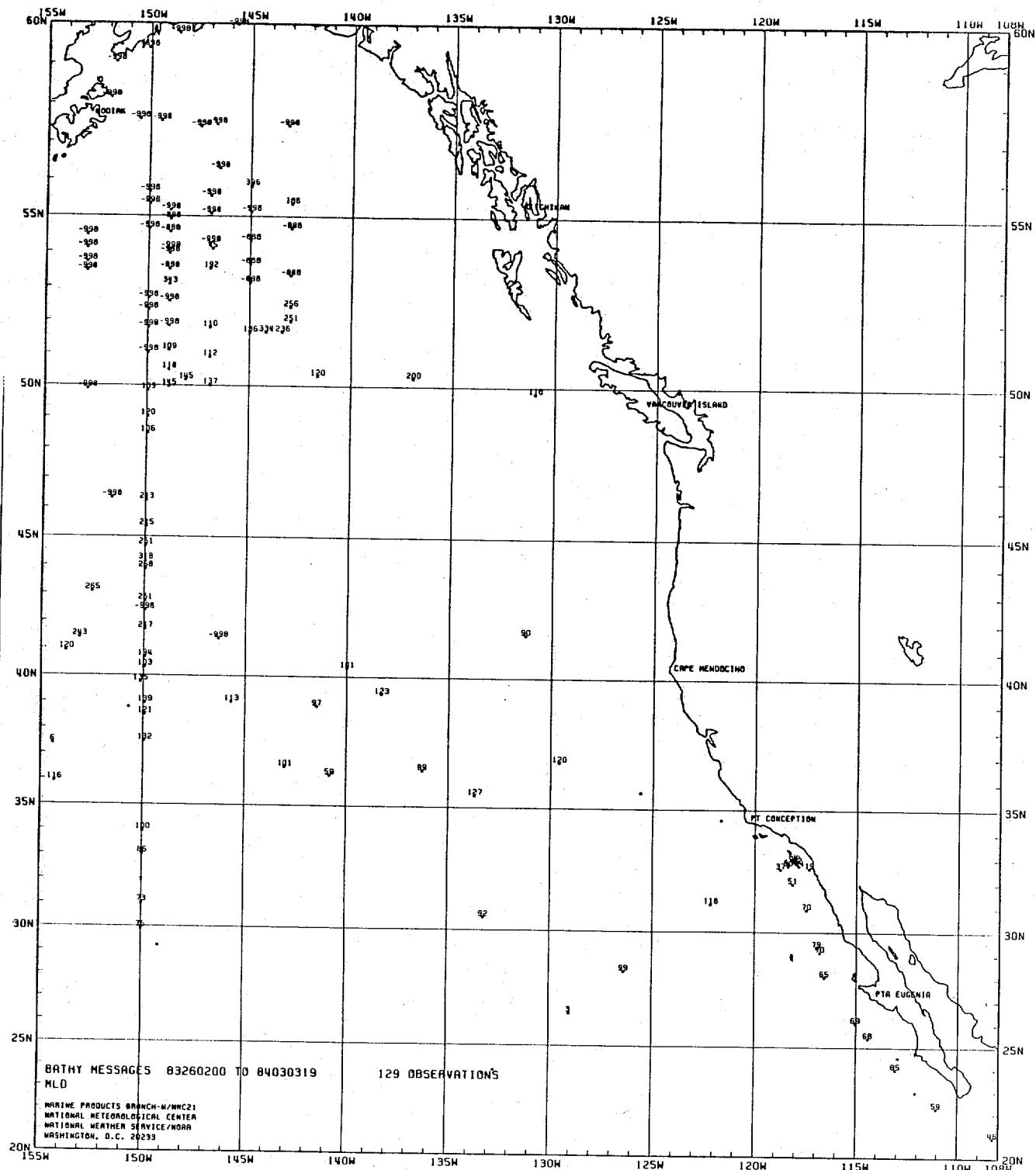


Figure 8
 Mixed Layer Depth
 Feb. 26 - Mar. 3, 1984

JJ 4054 1731/ 73533 12145 88888 00120 01111 99901 12110 26121 48112 88111 99902 21113 23157 29135 36125 52118 55119 56129
 63117 99903 48113 52121 78114 85121 99904 56114+SHIP

5 4 17 31 35.5 121.7

0 12.0 1 11.1 113 11.0 126 12.1 148 11.2 188 11.1 221 11.3 223 15.7
 228 13.5 236 12.5 252 11.8 255 11.9 256 12.9 263 11.7 348 11.3 352 12.1
 378 11.4 385 12.1 456 11.4

PRIMARY LAYER DEPTH 113.00

***** BATHY PROFILE CHECK *****

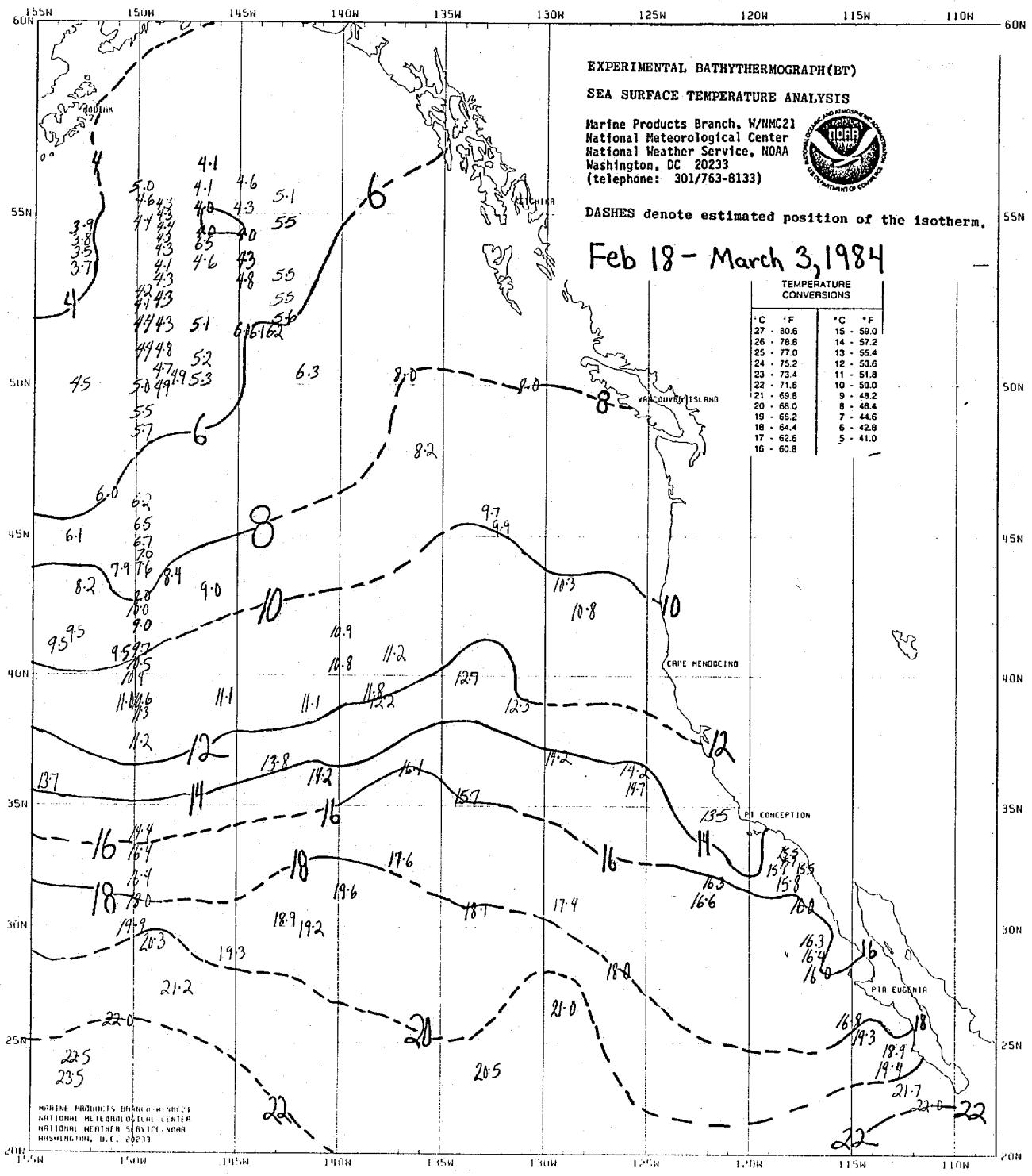
TEMP GRADIENT IS EXCESSIVE 4.4C THROUGH DEPTH 221. 223. 229.

TEMP SPIKE IS EXCESSIVE 2.2C THROUGH DEPTH 221. 223. 229.

INTERPOLATED TEMP & DEPTH AT 10M INTERVAL															
120	0	110	10	110	20	110	30	110	40	110	50	110	60	110	70
110	80	110	90	110	100	110	115	120	119	130	115	140	111	150	
111	160	111	170	111	180	111	180	111	200	112	210	112	220	133	230
123	240	118	250	122	260	116	270	116	280	115	290	115	300	114	310
114	320	112	330	113	340	117	350	118	360	116	370	116	380	120	390
119	400	118	410	117	420	116	430	115	440	114	450				



Figure 9
 Sample Spike/Gradient Check



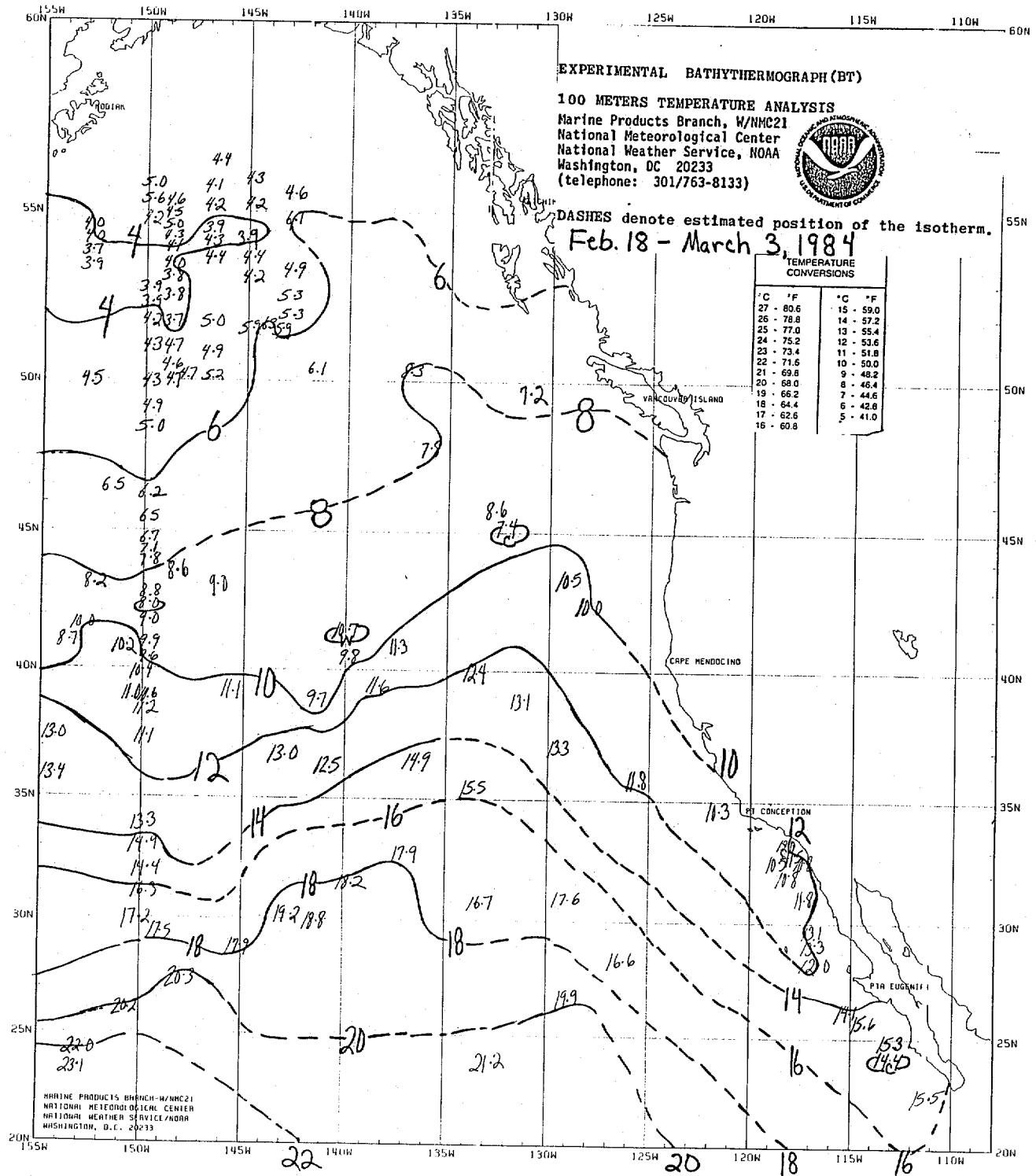


Figure 11
BATHY 100m Subsurface Temperature Analysis